REMARKS

Claims 1 and 67-68 are amended. Claims 21-28, 30, 32, 33, 58, 69-71, and 59-61 are allowed. Reconsideration of the application in view of the amendments and the remarks to follow is requested.

Claims 67 and 68 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for lacking antecedent basis. Both claims are amended to provide antecedent basis, and therefore, the rejection is rendered moot.

Claims 1-3, 7 and 62 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hori et al. (5,302,240) in view of Dahm et al. (5,431,778). Claim 6 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Hori et al. in view of Dahm et al. and further in view of Barnes et al. (5,505,816). Claims 10-13 and 16-19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hori et al. in view of Dahm et al. Claims 36-42, 44, 46, and 72 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hori et al. in view of Dahm et al. and further in view of Hong (6,103,070). Claims 47-48, 50, 53-57, 63-66, and 73-77 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hori et al. (5,302,240) in view of Westendorp et al. (5,565,036).

Claim 1 recites etching a semiconductor wafer with a plasma etching material, the plasma etching material forming a polymer comprising carbon and a halogen. For ease of discussion, this limitation will be referred to as the "first plasma etch" with respect to claim 1. Claim 1 further recites the polymer comprising carbon and a halogen over at least some internal surfaces of a

plasma etched chamber (Note: Hori does not teach this limitation as correctly stated by the Examiner at pg. 3 of paper no. 16). Claim 1 further recites after forming the polymer, plasma etching using a gas effective to etch polymer from chamber internal surfaces, the gas having a hydrogen component effective to form a gaseous hydrogen halide from hydrogen liberated from the polymer. For ease of discussion, this limitation will be referred to as the "second plasma etch" with respect to claim 1. The Examiner relies on Hori of the combination of Hori and Dahm to allegedly teach the first **and second** plasma etches recited in claim 1. The combination of art fails to teach a plurality of plasma etches. Only one embodiment of Hori (see column 29 and Figs. 21A-B) teaches etching a semiconductor wafer with a plasma etching material, the plasma etching material forming a polymer comprising carbon and a halogen as positively recited in claim 1 (first plasma etch). However, Hori fails to provide a second plasma etch to etch the polymer. That is, after forming the polymer as positively recited in claim 1, Hori fails to teach a second plasma etch, and therefore, does not teach or suggest a plasma etching using a gas effective to etch polymer from chamber internal surfaces, the gas having a hydrogen component effective to form a gaseous hydrogen halide from hydrogen liberated from the polymer as positively recited in claim 1. Consequently, the Examiner has not presented any teachings to **a second plasma etch** as positively recited in claim 1. Since the combination of Hori and Dahm fails to teach this positively recited limitation of claim 1, claim 1 is allowable.

Further evidence that the Hori does not teach the first and second plasma

etch of claim 1 is demonstrated by reviewing the teaching of Hori for which the Examiner relies to allegedly teach the second plasma etch. The Examiner relies on column 20, lines 56-59 (page 3 of paper no. 16). However, this section of Hori teaches that after a contact hole is formed, F or S (probably should be Si) was left on the surface of a AlSiCu layer. F or S **is not** a polymer comprising carbon and a halogen as positively recited in claim 1 for which the second plasma etch of claim 1 is positively recited to etch ("plasma etching using a gas effective to etch the polymer"). Consequently, this section of Hori does not teach any positively recited limitations of claim 1. Claim 1 is allowable.

Additionally, the Examiner correctly states that Hori fails to teach forming the polymer over at least some internal surfaces of a plasma etched chamber as positively recited in claim 1, and then relies on the teachings of Dahm to allegedly provide the deficiency in teachings of Hori. However, one skilled in the art with the teachings of Hori would never look to Dahm for additional teachings. The Examiner is respectfully reminded that "[p]referably the Examiner's explanation should be such that it provides that impetus necessary to cause one skilled in the art to combine the teachings of the references to make the proposed modification." *Ex Parte Levengood,* 28 USPQ2d, 1300, 1301, Footnote 2, (Bd. Pat. App. and Inter. 1993) (citations omitted). Hori teaches RIE processing of resist, carbon, metal and silicon dioxide layers over a substrate using CHF_3 and CF_4 as the RIE chemistries for etching the resist, carbon, and silicon dioxide layers (see example 1 of Hori at col. 12, lines 5-40; see also, col. 13, lines 30-40; col. 23, lns. 35-55).

However, the entire focus of Dahm is to avoid using these halogenated hydrocarbon gases stating, "common gases used to etch such silicon layers include CF_4, C_2F_6, or CHF_3...[however], [d]ue to a growing concern for our environment and the potential problems of continued use of hydrocarbon source gases in semiconductor manufacturing, these gases may become scarce, more expensive, and are heavily regulated by government agencies in an effort to discourage use." (Col. 1, lines 15-40). That is, the entire focus of Dahm is to avoid using these halogenated hydrocarbon gases as plasma source gases wherein Hori relies on such halogenated hydrocarbon gases for etching. This is a clear "teaching away" and teaching away from the art is a *per se* demonstration of lack of obviousness. *In re Dow Chemical Co.*, 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988). One skilled in the art with the Hori teachings would have no motivation to look to Dahm for teachings because Dahm teaches to avoid the source gases that Hori depends on for etching. Accordingly, the Examiner simply has not provided that impetus necessary to cause one skilled in the art to combine the teachings of the references. Without an appropriate motivational rationale for combining the references, the obviousness rejection must fail. For all the above reasons, claim 1 is allowable over the combination of Hori and Dahm.

Claims 2-3, 6-7, 62-67 and 80 depend from independent claim 1, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown or taught by the art of record.

For example, dependent claim 6 is rejected over the combination of Hori, Dahm and Barnes. Claim 6 recites a hydrogen component comprises NH_3. The Examiner correctly states that Hori and Dahm do not teach the use of ammonia, and accordingly, relies on Barnes for such deficiency in teachings. The Examiner provides a motivational rationale for modifying Hori and Dahm by the teachings of Barnes stating that it would be obvious to substitute the Hori and Dahm fluorocarbon gas with ammonia gas in view of Barnes teaching that the creation of ammonia within the etch chamber provides for enhanced directional etching capabilities and results in improved anisotropic etching. However, Barnes does not state that the ammonia provides a better or more enhanced directional etching capabilities than the fluorocarbons of Hori and Dahm, and in fact, states that both, ammonia and fluorocarbons, provide enhanced directional etching capabilities. "It is therefore an object of the present invention to use a gas mixture of NH_3 and NF_3 **or** CF_4 and O_2 mixed with H_2 and N_2 to provide an improved means for selectively etching silicon dioxide" (col. 2, lines 20-25). CF_4 is a fluorocarbon. Therefore, Barnes teaches that the fluorocarbon (which is used in Hori and Dahm) and ammonia provide the enhanced means of selective etching. Therefore, since both provide the same enhanced selective etching, the same benefit, one skilled in the art using the fluorocarbon as taught by Hori and Dahm would not look to Barnes for a different chemistry that provides no added benefit but for improperly using Applicant's disclosure.

Since the Examiner has not provided any desirability for the modifying the inventions of Hori and Dahm by the teachings of Barnes, the Examiner is simply

stating that the references can be combined or modified, and therefore, it is obvious to do so, contrary to Federal Circuit law. The Examiner is reminded that the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. MPEP §2143.01 (8th edition) *citing In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so". 916 F.2d at 682, 16 USPQ2d at 1432; MPEP §2143.01; See also *In re Finch*, 972 F.2d, 1260, 23 USPQ2d, 1780 (Fed. Cir. 1992). Under this authority, simply because you can substitute one chemistry for another does not provide the motivational rationale to make the substitution or modification without the desirability to do so, which the Examiner has not provided. Therefore, the combination of Barnes to modify the Hori and Dahm inventions does not exist and must fail. Accordingly, logically, the obviousness rejection based upon this improper combination of art must fail. For this reasons, claim 6 is allowable.

Additionally, regarding dependent claims 63-66, such are rejected over the combination of Hori, Dahm and Westendorp. Claim 63 recites a hydrogen component comprises at least H_2 and NH_3; claim 64 recites a hydrogen component comprises at least NH_3 and CH_4; claim 65 recites a hydrogen component comprises H_2, and H_3 and CH_4; and claim 66 recites a hydrogen component comprises N_2 and H_2. The Examiner correctly states that Hori and Dahm do not disclose these hydrogen components (page 12 of paper no. 16),

and relies on Westendorp to allegedly provide the deficiency in teachings. The Examiner states that it would be obvious to modify Hori and Dahm by using the gas mixture as taught by Westendorp because Westendorp states that the improvements of this invention include a variety of gases which operate in combination with one another as the ionization element (pg. 12 of paper no. 16). That is, Westendorp is directed to teaching an apparatus and method for improving igniting plasma within a process module (Abstract). However, since Hori and Dahm are not concerned with improving igniting plasma within a process module, the Examiner's motivational rationale has no relevance to the teaching of Hori and Dahm. Consequently, one skilled in the art with the understanding and concerns of Hori and Dahm has no reasonable motivational rationale for looking to teachings of Westendorp to modify the inventions of Hori and Dahm. The Examiner is merely suggesting substituting the teaching of Westendorp for the other references contrary to the above stated authority, without any desirability for doing so. Without a proper motivational rationale for the combination, the obviousness rejection against claims 63-66 must fail. Claims 63-66 are allowable.

Referring to independent claim 10, the Examiner relies on the combination of Hori and Dahm. Claim 10 recites etching a semiconductor wafer with a plasma etching material, the material forming a polymer comprising carbon halogen. For ease of discussion with respect to claim 10, this limitation can be referred to as the first plasma etch. Claim 10 further recites after forming the polymer, plasma etching at said atmospheric pressure using a gas effective to

etch polymer from the chamber internal surfaces, the gas comprising a carbon compound effective to getter the halogen from the etched polymer. For ease of discussion with respect to claim 10, this limitation can be referred to as the second plasma etch. Hori and Dahm, singularly or in any combination, fail to teach the positively recited first and second plasma etches. Only one embodiment of Hori (see column 29 and Figs. 21A-B) teaches etching a semiconductor wafer with a plasma etching material, the plasma etching material forming a polymer comprising carbon and a halogen as positively recited in claim 10 (first plasma etch). However, Hori fails to provide a second plasma etch to etch polymer. That is, after forming the polymer as positively recited in claim 10, Hori fails to teach or suggest a second plasma etch, and therefore, does not teach or suggest plasma etching at said atmospheric pressure using a gas effective to etch polymer from the chamber internal surfaces, the gas comprising a carbon compound effective to getter the halogen from the etched polymer as positively recited in claim 10. Accordingly, for at least this reason, the combination of Hori and Dahm fail to teach positively recited limitations of claim 10. Claim 10 is allowable.

Moreover, the motivational rationale to combine Hori and Dahm does not exist, and therefore, the obviousness rejection fails for this reason. One skilled in the art with the teachings of Hori would never look to Dahm for additional teachings. Hori teaches using CHF_3 and CF_4 as RIE chemistries for etching and Dahm teaches to avoid using these halogenated hydrocarbon gases. This is a clear "teaching away", and one skilled in the art with the Hori teachings would

have no motivation to look to Dahm for teachings because Dahm teaches to avoid the source gases that Hori depends on for etching. Accordingly, the Examiner simply has not provided that impetus or desirability necessary to cause one skilled in the art to combine the teachings of the references. Without an appropriate motivational rationale for combining the references, the obviousness rejection must fail. For all the above reasons, claim 10 is allowable over the combination of Hori and Dahm.

Claims 11-13, 16-19, 67-68, and 81 depend from independent claim 10, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown or taught by the art of record.

Independent claim 36 is rejected over the combination of Hori, Dahm and Hong, and recites a first plasma etching material on the semiconductor wafer through openings formed in the photoresist layer with a gas comprising carbon and a halogen, a polymer comprising carbon and the halogen forming over at least some internal surfaces of the plasma etch chamber during the first plasma etching. Claim 36 further recites after the first plasma etching and with the wafer on the wafer receiver, second plasma etching at subatmospheric pressure using a gas having one or more components effective to etch photoresist from the substrate and polymer from chamber internal surfaces and getter halogen liberated from the polymer to restrict further etching of the material on the semiconductor wafer during the second plasma etching, the gas having the one or more components comprising at least H_2 and CH_4.

However, the combination of art fails to provide a second plasma etch to etch polymer. That is, Hori (for which the Examiner relies to teach the limitation) fails to teach or suggest after the first plasma etching and with the wafer on the wafer receiver, second plasma etching as positively recited in claim 36. Accordingly, for at least this reason, the combination of art fails to teach or suggest positively recited limitations of claim 36. Claim 36 is allowable.

Additionally, the motivation rationale for combining Hori and Dahm fails because Hori teaches using CHF_3 and CF_4 as RIE chemistries for etching and Dahm teaches to avoid using these halogenated hydrocarbon gases. This is a clear "teaching away", and one skilled in the art with the Hori teachings would have no motivation to look to Dahm for teachings because Dahm teaches to avoid the source gases that Hori depends on for etching. Without an appropriate motivational rationale for combining the references, the obviousness rejection must fail. For at least this reason, claim 36 is allowable over the combination of art.

Moreover, claim 36 recites negatively biasing the wafer receiver to a range of 100 to 400 volts. The Examiner correctly states that Hori and Dahm fail to teach such recited limitation, and then relies on the alleged teachings of Hong to provide the deficiency in teachings of Hori and Dahm (page 8 of paper no. 16). The motivational rationale stated by the Examiner is that since Hori discloses biasing a wafer receiver, one skilled in the art would have found it obvious to modify Hori and Dahm's method by providing negative bias voltage as per Hong because Hong states that pedestal bias voltage of a negative 30

is satisfactory and may range from negative 20 to a negative 100 volts (page 8 of paper 16). However, this statement is completely devoid of any motivation to use the negative voltage teaching of Hong to modify the Hori and Dahm inventions. That is, no stated benefit or advantage is presented that would provide that impetus or desirability for one skilled in the art to modify the Hori and Dahm inventions. Respectfully, the Examiner is simply stating is that since the references can be combined, it is obvious to do so, contrary to the above-stated authority of the Federal Circuit (the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, *supra*). Since the Examiner has not provided any desirability of the combination, the modification of the Hori and Dahm inventions by Hong must fail along with the obviousness rejection based on the improper motivational rationale. Claim 36 is allowable for all the above stated reasons.

Claims 37-42, 44-46, 72-74, and 83 depend from independent claim 36, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown or taught by the art of record.

Independent claim 47 is rejected over the combination of Hori, Dahm and Westendorp. Claim 47 recites after a first plasma etching and with a wafer on a electrostatic chuck, providing the electrostatic chuck at ground or floating potential while second plasma etching. Hori, Dahm and Westendorp, singularly or in any combination, fail to teach or suggest the first and second plasma

etchings as positively recited in claim 47. For at least this reason, claim 47 is allowable.

Moreover, the combination of art fails to teach providing the electrostatic chuck at ground or floating potential. The Examiner relies on Hori to allegedly teach such limitation (pg. 10 of paper no. 16), but Hori only teaches "to apply a bias potential to the substrate" (col. 34, lns. 35-40). However, a bias potential to the substrate is not a teaching to **ground or floating potential** to the electrostatic chuck as positively recited in claim 47. For at least this reason, claim 47 is allowable.

Furthermore, claim 47 recites a hydrogen component comprising at least a hydrocarbon and NH_3. Properly stated by the Examiner, Hori and Dahm fail to teach this etching chemistry and relies on Westendorp to provide the alleged deficiencies in teachings of Hori and Dahm (pg. 10 of paper no. 16). However, the Examiner provides no impetus or motivational rationale for combining Westendorp with the other references and simply states that Westendorp teaches the mixture of gases is ignitable in a plasma reactor, and therefore, provides the reference to modify Hori and Dahm. However, without a motivational rationale, the Examiner is merely stating that the reference can be combined, and therefore, it is obvious to do so which is contrary to the above stated Federal Circuit law. The mere fact that references can be combined or modified does not render the resulting combination obvious unless the prior art also suggests the desirability of the combination. Since the Examiner has not provided the desirability of the combination, pursuant to Federal Circuit law, the obviousness

rejection must fail. For at least this reason, claim 47 is allowable.

Additionally, the motivation rationale for combining Hori and Dahm fails because Hori teaches using CHF_3 and CF_4 as RIE chemistries for etching and Dahm teaches to avoid using these halogenated hydrocarbon gases. Without an appropriate motivational rationale for combining the references, the obviousness rejection must fail. For all the above-stated reasons, claim 47 is allowable over the combination of art.

Claims 48-50, 53, 75-77, and 84 depend from independent claim 47, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown or taught by the art of record.

Regarding independent claim 54, such is rejected over a combination of Hori, Dahm and Westendorp. Independent claim 54 recites after a first plasma etching and with a wafer on a electrostatic chuck, providing the electrostatic chuck at ground or floating potential while second plasma etching. Hori, Dahm and Westendorp, singularly or in any combination, fail to teach or suggest first **and** second plasma etchings. For at least this reason, claim 54 is allowable.

Moreover, the combination of art fails to teach providing the electrostatic chuck at ground or floating potential. The Examiner relies on Hori to allegedly teach such limitation (pg. 10 of paper no. 16), but Hori only teaches "to apply a bias potential to the substrate" (col. 34, lns. 35-40). However, a bias potential to the substrate is not a teaching to **ground or floating potential** to the electrostatic chuck as positively recited in claim 54. For at least this reason,

claim 54 is allowable.

Additionally, the motivation rationale for combining Hori and Dahm fails because Hori teaches using CHF_3 and CF_4 as RIE chemistries for etching and Dahm teaches to avoid using these halogenated hydrocarbon gases. Without an appropriate motivational rationale for combining the references, the obviousness rejection must fail. For all the above-stated reasons, claim 54 is allowable over the combination of art.

Claims 55-57, 78-79, and 85 depend from independent claim 54, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown or taught by the art of record.

Further, Applicant herewith submits a duplicate copy of the Supplemental Information Disclosure Statement and Form PTO-1449 filed in this application on June 30, 2003. No initialed copy of the PTO-1449 has been received back from the Examiner. To the extent that the submitted references listed on the Form PTO-1449 have not already been considered, and the Form PTO-1449 has not been initialed with a copy being returned to Applicant, such examination and initialing are requested at this time, as well as return of a copy of the initialed Form PTO-1449 to the undersigned.

This application is now believed to be in immediate condition for allowance, and action to that end is respectfully requested. If the Examiner's next anticipated action is to be anything other than a Notice of Allowance, the undersigned respectfully requests a telephone interview prior to issuance of any

such subsequent action.

Respectfully submitted,

Dated: 12-18-03

By: _____
D. Brent Kenady
Reg. No. 40,045